भारतीय मानक
Indian Standard

IS 9851 : 2020

आईसो-प्रोपाइल ईथर की विशिष्टि

(पहला पुनरीक्षण)

Specification for *iso*-Propyl Ether

(First Revision)

ICS 71.080.60

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भारतीय मानक ब्यूरो
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February 2020 **Price Group 5**

Organic Chemicals, Alcohols and Allied Products Sectional Committee, PCD 09

FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Organic Chemicals, Alcohols and Allied Products Sectional Committee had been approved by the Petroleum, Coal and Related Products Division Council.

This standard was originally published in 1981 and being revised to update cross referred standards.

iso-propyl ether is a colourless mobile liquid with a characteristic ethereal odour. It is similar in many of its properties to ethyl ether. It has a higher boiling point, lower volatility and lower water solubility than ethyl ether. It is almost immiscible with water but miscible with most organic liquids. It is a solvent for many organic substances. It is used in the extraction of rare metal salts, extraction of phenol in the lignite industry and as an extractant for alkaloids. It is also employed as a solvent for certain specialized lacquers and in the preparation of collodion solution and textile spot cleaning agent.

The Indian standards listed in Annex B which are referred in this standard are informative in nature. All standards are subject to revision and parties to agreement based on standard are encouraged to apply the most recent editions of the standards.

The composition of the Committee, responsible for the formulation of this standard is given at Annex C.

For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 ‘Rules for rounding off numerical values (*revised*)’. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

SPECIFICATION FOR *iso*-PROPYL ETHER

(First Revision)

1 SCOPE

This standard prescribes the requirements and methods of sampling and test for iso-propyl ether for industrial purposes.

2 REFERENCES

The following Indian Standards contain provisions which through reference in this text constitute the provisions of the standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

IS No.	*Title*
229 : 1993	Specification for sodium sulphite, anhydrous (*fourth revision*)
1260 (Part 1) : 1973	Pictorial marking for handling and labelling of goods: Part 1 Dangerous goods (*first revision*)
2362 : 1993	Determination of water by Karl Fischer method — Test method (*second revision*)

3 REQUIREMENTS

3.1 Description

The material shall be clear, free from sediment and matter in suspension, and shall consist essentially of $[(CH_3)_2CH]_2O$.

3.2 The material shall be inhibited with a suitable anti-oxidant, such as, 2-6-di-tertiary-butyl-4-methyl phenol to prevent peroxides formation.

3.3 The material shall also comply with the requirements given in Table 1 when tested according to the method prescribed in Annex A. Reference to the relevant clauses of Annex A is given in column 4 of Table 1.

Table 1 Requirements for *iso*-Propyl Ether

(*Clause* 3.3)

Sl No. (1)	Characteristic (2)	Requirement (3)	Methods of Test (Ref to Clause No. in Annex A) (4)
i)	Colour, *Max.*	30 Hazen	**A-2** or any other suitable instrumental method
ii)	Relative density at 27/27°C	0.715 to 0.721	**A-3**
iii)	Distillation range, percent by volume, *Min*	95 percent shall distil within the range of 63.0 to 70.0°C; the temperature being corrected* for a pressure of 760 mm Hg	**A-4** (*see* Note)
iv)	Acidity (other than carbon dioxide), as accetic acid (CH_3COOH), percent by mass, *Max*	0.02	**A-5**
v)	Alcoholic impurities (as iso-propyl alchohol), percent by mass, *Max*	3.0	**A-6**
vi)	Ketonic impurities (as acetone), percent by mass, *Max.*	1.0	**A-6**
vii)	Peroxides (as active oxygen), mg/1, *Max.*	5	**A -7**
viii)	Water content, percent by mass, *Max,*	0.2	**A -8**

NOTE — The test for the distillation range shall not be carried out on a sample which is found to be failing in peroxide test.

* When the corrected barometric pressure deviates from 760 mm Hg, apply further correction to the observed temperature by subtracting 0.040ºC for every millimeter above 760 mm or by adding 0.040°C for every millimeter below 760 mm. This correction is valid only for pressure above 700 mm Hg.

4 PACKING AND MARKING

4.1 Packing

The material shall be supplied in sound and clean containers as agreed to between the purchaser and the supplier. The containers shall be stored in a place protected from direct sunlight.

CAUTION — Higher peroxide concentration may lead to an explosion .Peroxide concentration shall be checked periodically to ensure that the concentration is within the prescribed limits.

4.2 Marking

4.2.1 The containers shall be marked with the following information:

a) Name of the material;
b) Net mass;
c) Name of the manufacturer and recognized trade-mark, if any;
d) Batch number; and
e) Date of manufacture.

4.2.2 Each container shall have the caution label 'FLAMMABLE' together with the corresponding symbol for labelling of dangerous goods as given in Fig. 5 of IS 1260 (Part1).

NOTES:

1 Necessary safeguards against the risk arising from the storage and handling of large volumes of flammable liquids shall be provided and all due precautions shall be taken at all times to prevent accidents by fire or explosions.

2 Except when they are opened for the purpose of cleaning and rendering them free from vapour, all empty tanks or other containers shall be kept securely closed unless they have been cleaned and are free from vapour.

4.2.3 *BIS Certification Marking*

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act*, 2016 and the Rules and Regulations framed thereunder, and the product(s) may be marked with the Standard Mark.

5 SAMPLING

5.1 Representative samples of the material shall be drawn as prescribed in Annex F of IS 229.

5.2 Criteria for Conformity

The lot shall be declared as conforming to the standard if the test results of the composite test sample satisfy the requirements prescribed under **3.3**. Otherwise the lot shall be rejected.

ANNEX A

(*Clause* 3.3 and *Table* 1)

METHODS OF TEST FOR *iso*-PROPYL ETHER

A-1 QUALITY OF REAGENTS

Unless specified otherwise, pure chemicals and distilled water (*see* IS 1070) shall be employed in tests.

NOTE — 'Pure chemicals' shall mean chemicals that do not contain impurities which affect the results of analysis.

A-2 TEST FOR DETERMINATION OF COLOUR

The colour of the material is compared with that of the colour standard and expressed in terms of Hazen colour units. The Hazen colour which is defined as the colour of an aqueous solution containing 1 ppm of platinum in the form of Chloroplatinic acid and 2 ppm of cobaltous chloride ($CoC1_2.6H_2O$).

A-2.1 Apparatus

A-2.1.1 *Nessler Cylinder,* two, 100 ml capacity (*see* IS 4161).

A-2.1.2 *One-Mark Graduated Flasks,* 250 and 500 ml capacities (*see* IS 915).

A-2.2 Reagents

A-2.2.1 *Cobaltous Chloride Hexahydrate*

A-2.2.2 *Hydrochloric Acid,* relative density 1.18 (*see* IS 265).

A-2.2.3 *Chloroplatinic Acid* — Dissolve 250 mg of platinum in a small quantity of *aqua regia* contained in a glass or porcelain basin by heating on a water bath. When the metal has dissolved, evaporate the solution to dryness. Add 1 ml of the hydrochloric acid and again evaporate to dryness Repeat this operation twice more.

A-2.3 Preparation of Colour Standards

Dissolve 0.50 g of the cobaltous chloride hexahydrate and whole of the chloroplatinic acid (*see* **A-2.2.3**) in 50 ml of the hydrochloric acid. Warm, if necessary, to obtain a clear solution and after cooling, pour into the 500 ml graduated flask. Dilute with water to the mark.

A-2.3.1 Pipette 15 ml of this solution (*see* **A-2.3**) into a 250-ml graduated flask. Dilute with water up to the graduation mark. This diluted solution is equivalent to 30 Hazen units and shall always be freshly prepared.

A-2.4 Procedure

Fill one of the Nessler cylinders to the mark with the material to be tested, and the other with the colour standard using a white background. Compare the colours.

A-3 DETERMINATION OF RELATIVE DENSITY

In this method, mass of equal volumes of material and water are compared.

A-3.1 Apparatus

A-3.1.1 *Relative Density Bottle, 25* ml capacity.

A-3.1.2 *Water Bath,* maintained at 27.0 ± 0.2°C.

A-3.1.3 *Thermometer,* any convenient thermometer of a suitable range with 0.1°C or 0.2°C subdivisions.

A-3.2 Procedure

Clean and dry the relative density bottle, weigh and then fill with recently boiled and cooled water at 27°C. Fill to overflowing by holding the relative density bottle on its side in such a manner as to prevent entrapment of air bubbles. Insert the stopper and immerse in the water bath. Keep the entire bulk completely covered with water and hold at that temperature for 30 min. Carefully remove any water which has exuded from the capillary opening. Remove from the bath, wipe completely dry and weigh. Again clean and dry the relative density bottle. Using the material under test, proceed exactly as in the case of water and weigh the bottle with the material.

A-3.3 Calculation

$$\text{Relative density at 27°C/27°C} = \frac{A-B}{C-B}$$

Where,

A = mass in g, of the relative density bottle with the material,

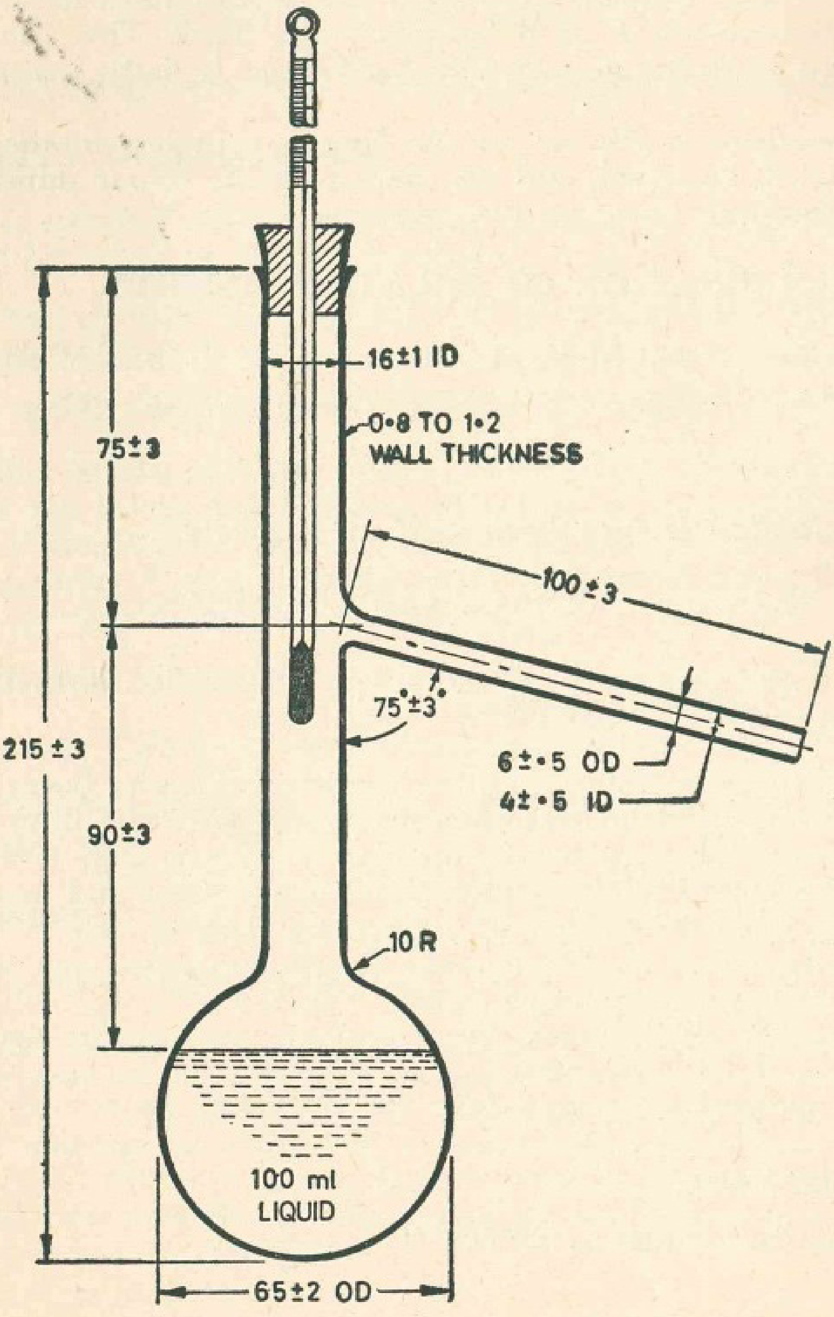
B = mass in g, of the relative density bottle, and

C = mass in g, of the relative density bottle with water

A-4 DETERMINATION OF DISTILLATION RANGE

A-4.1 Apparatus

A-4.1.1 *Distillation Flask,* of shape and dimensions given in Fig. 1. Fix the flask in vertical position by means of a clamp at the extreme upper end of the neck.



All dimensions in millimetres.

FIG. 1 DISTILLATION FLASK (CAPACITY 130 ± 5 ml)

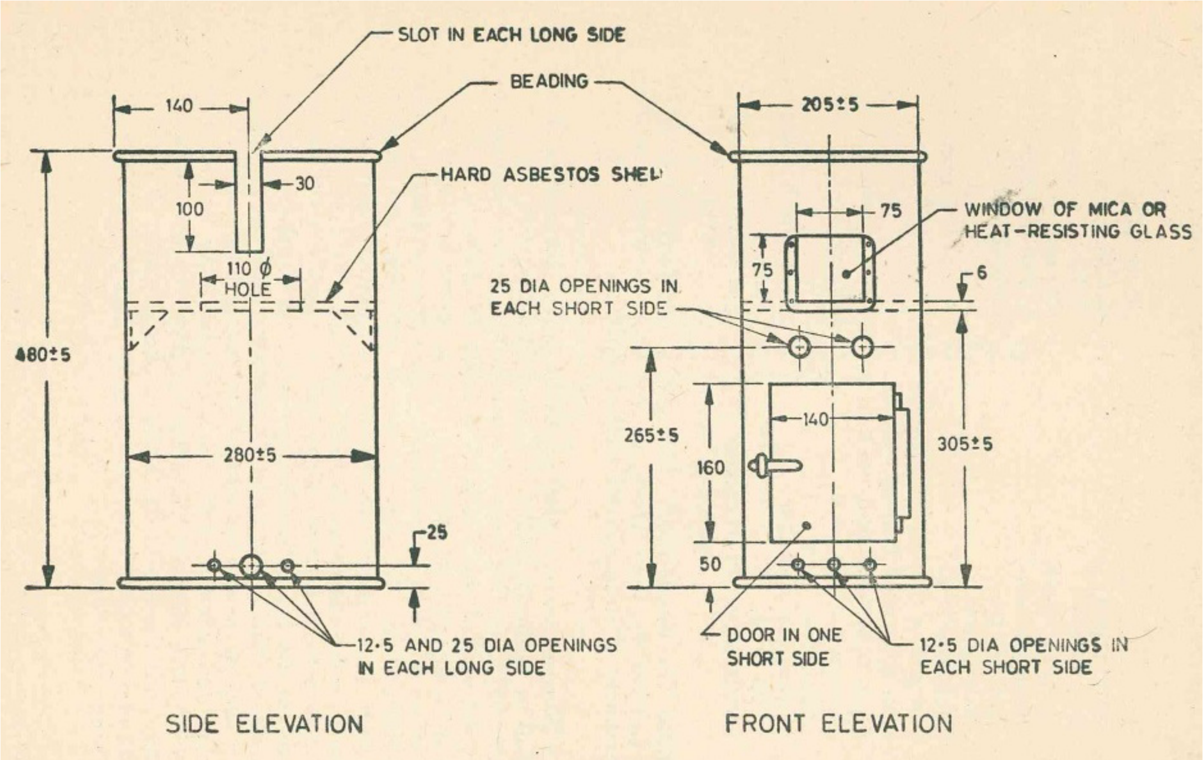
A-4.1.2 *Thermometer**, conforming to the following requirements is:

Range	30 to 200°C
Graduation	0.2°C
Immersion	Total
Overall length	390 mm
Stem diameter	5.5 to 8.0 mm
Bulb shape	Cylindrical
Bulb length	9 to 14 mm
Bulb diameter	4.5 to 5.5 mm
Length of graduated portion	245 to 280 mm
Distance from bottom of bulb to bottom of main scale	75 to 90 mm
Longer lines at each	1°C
Figured at each	5°C
Expansion chamber	To allow heating to 250°C
Top finish	Ring
Scale error not to exceed	±0.3°C

A-4.1.2.1 The thermometer shall bear a certificate from the National Physical Laboratory, New Delhi, or any other institution authorized by the Government of India to issue such a certificate.

A-4.1.3 *Draught Screen*

The construction and dimensions of a draught screen shall be as shown in Fig. 2. A shelf of a heat-resisting hard asbestos compound, 6 mm in thickness with a central circular hole of 110 mm in diameter, the edge of which is levelled to fit the contours of the distillation flask, shall be supported horizontally in the screen and shall fit closely to the sides of the screen to ensure that hot gases from the source of heat do not come in contact with the sides or neck of the flask. The supports for this asbestos shelf may conveniently consist of triangular pieces of metal sheet firmly fixed to the screen at its four corners. In each of the longer sides of the screen there shall be one large and two small holes at the base, and a vertical slot at the top. A removable shutter conforming to the dimensions given in Fig. 3 shall be provided for closing whichever vertical slot is not in use. In each of the shorter sides of the screen there shall be two circular holes below the asbestos shelf, three circular holes at the base, and a central window of mica



All dimensions in millimetres.

Fig. 2 Draught Screen

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* Thermometers with the Institute of Petroleum designation IP 61C conform to these requirements. Any other thermometer of similar range and accuracy may also be used.

or heat-resisting glass, the bottom of which shall be levelled with the top of the asbestos shelf. In one of the shorter sides there shall also be a door, overlapping an opening in the screen by approximately 5 mm, all round.

A-4.1.4 *Liebig Condenser*

With the bent end made of good quality resistant glass having a wall thickness of 1 to 1.5 mm and conforming to the shape and dimensions given in Fig. 4. Alternatively, the bent portion may be substituted by an adapter fitted externally in such a manner that the distillate does not come in contact with the cork.

A-4.2 Procedure

Assemble the apparatus as shown in Fig. 5. Measure 100 ml of the sample into the distillation flask from a graduated measuring cylinder and add a few antibumping granules. Place the flask, thermometer and a suitable receiver in position and ensure that the condenser has a steady supply of water. Adjust the rate of heating so that the first drop of distillate falls from the end of the condenser in 7 to 12 min. Read the temperature at the instant the first drop falls from the end of the condenser and record as the observed initial boiling point.

Further adjust the rate of heating so that the distillate is collected at the rate of 3 to 4 ml per minute. Read the temperature indicated at the instant the last drop of liquid evaporates from the lowest point in the distillation flask and record as the observed dry point. Disregard any liquid on the side of the flask.

A-4.3 Corrections

A-4.3.1 *Error of Thermometer Scale*

In all thermometer readings make the corrections as indicated on the certificate of the instrument.

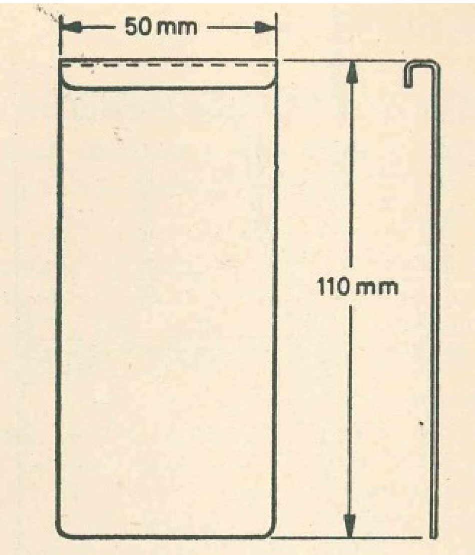

FIG. 3 REMOVABLE SHUTTER FOR DRAUGHT SCREEN

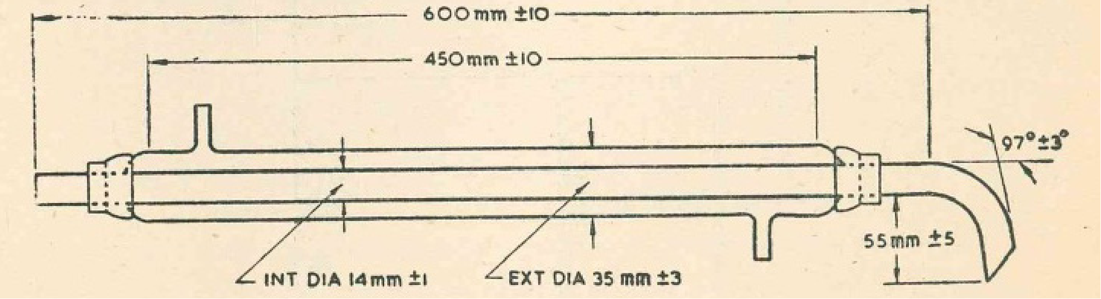

FIG. 4 LIEBIG CONDENSER

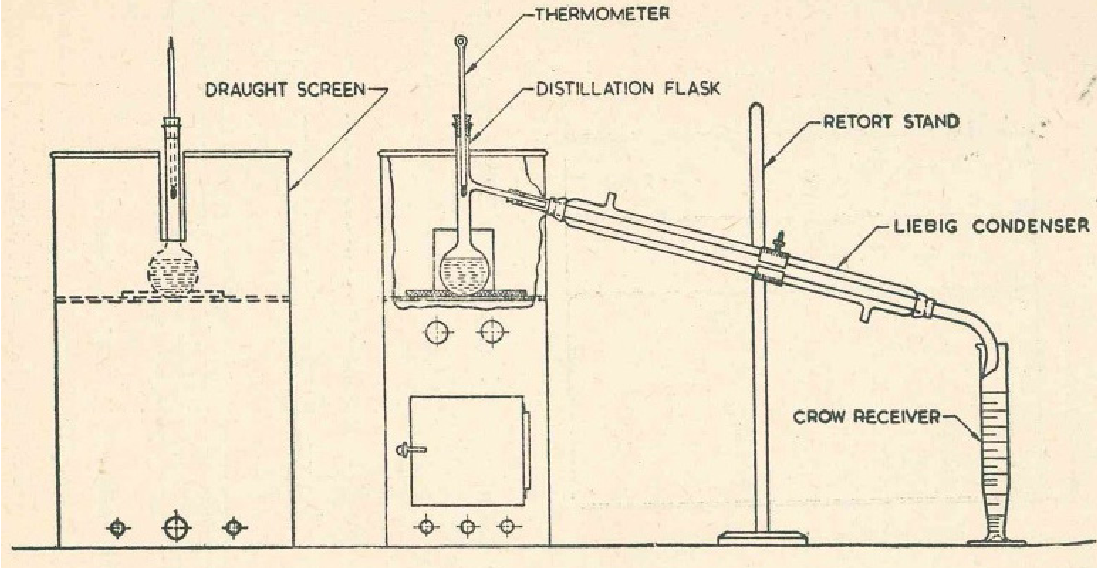

FIG. 5 ASSEMBLY OF APPARATUS

A-4.3.2 *Correction for Barometric Pressure*

The necessary correction shall be applied as given in Table 1.

A-5 DETERMINATION OF ACIDITY (AS ACETIC ACID)

The material is titrated with standard sodium hydroxide solution using phenolphthalein as indicator.

A-5.1 Reagents

A-5.1.1 *Phenolphthalein Indicator* , 0.5 percent (*m/v*). Dissolve 0.5 g of phenolphthalein in 100 ml of rectified spirit (*see* IS 323) and make it faintly pink by the addition of dilute sodium hydroxide solution.

A-5.1.2 *Standard Sodium Hydroxide Solution,* 0.01 N.

A-5.2 Procedure

Weigh accurately about 100 g of the material into a 500 ml conical flask to the nearest 0.1 g. Pour about 100 ml of freshly boiled and cooled distilled ~water and add 2 to 3 drops of phenolphthalein indicator. Mix well and note the colour of the solution. A pink coloration indicates the presence of alkalinity. If the solution is colourless, titrate with standard sodium hydroxide solution until a pale pink colour persists for more than 15 s.

A-5.2.1 Take 100 ml of distilled water in another 500 ml conical flask and carry out blank test.

A-5.3 Calculation

$$\text{Acidity (as acetic acid)} = \frac{(V_1 - V_2) \times N \times 0.06}{M} \times 100$$

Percent by mass

Where,

V_1 = volume in ml, of standard sodium hydroxide solution used in the test with the material;

V_2 = volume in ml, of standard sodium hydroxide solution used in blank test;

N = normality of standard sodium hydroxide solution; and

M = mass in g, of the material taken for the test.

A-6 TEST FOR DETERMINATION OF ALCOHOLIC IMPURITIES (GAS CHROMATOGRAPHIC METHOD)

A-6.1 Principle

Sample of the solvent is injected into the gas chromatograph where it is carried from one end of the column to the other. During its movement, the constituents of the sample undergo distribution at different rates and ultimately get separated from one another. The separated constituents emerge from the end of the column one after another and are detected by suitable means whose response is related to the amount of specific component leaving the column.

A-6.2 Apparatus

A-6.2.1 Any gas chromatograph capable of being operated under conditions given below for resolving the sample into distinct peaks may be used.

A–6.2.2 *Column Material/Conditions*

Copper tube length	180 cm; I.D. 4 mm; O. D. 6 mm
Immobile phase	Polyethylene glycol 400
Carrier	Sil-o-cel 50-80 mesh
Ration of immobile phase to carrier	25: 100
Packing density	0.6 g/cm^3 approximately
Column temperature	80°C
Carrier gas	H_2
Carrier gas flow	5 litres/hour
Bridge current	300 mA
Chart speed	30 cm/hour
Sample size	10 µl

A-6.2.3 *Sequence of Elution Relative Retention Time*

Component	*Minutes from Air Peak*
iso-Propyl ether (IPE)	0.5
Acetone or dimethylketone (DMK)	1.5
Methylethyl ketone (MEK)	2.2
iso-Propyl alcohol (IPA)	3.5
Methyl iso-butyl ketone (MIBK)	4.5
iso-Mesityl oxide (ISO-MO)	8.0
Mesityl oxide (MO) water (H_2O)	11.0
Methyl iso-butyl carbinol (MIBC)	15.5

A-6.3 Procedure

Conduct the flow of carrier gas and inject the sample at injection port where it is well mixed with carrier gas. This is then led into the chromatographic column. The constituents of the sample are separated out by virtue of their differing interaction with the stationary phase. For efficient separation it is necessary that the column is maintained at the temperature prescribed in **A-6.2.2**. As the sample enters detector, it gives a signal corresponding to the amount of a particular constituent leaving the column. From the specific area under the peak corresponding to particular impurity in the sample, quantity of impurity may be determined.

A-6.4 Calculation

Calculate from the peak areas of individual constituents from the chromatogram of the sample, concentrations of the constituents on the basis of the peak areas on the chromatogram obtained with known amount of constituents using the same apparatus under identical conditions.

A-7 TEST FOR THE DETERMINATION OF PEROXIDES

A-7.1 Apparatus

A-7.1.1 *Twin Platinum Electrodes*

A-7.1.2 *Electrometric Dead Stop Indicator Apparatus*

A-7.1.3 *Stirrer*

A-7.1.4 *Titration Flask, Well Covered with Holes for Burette etc.*

A-7.2 Reagents

A-7.2.1 *Glacial Acetic Acid*

A-7.2.2 *Potassium Iodide*

A-7.2.3 *Sodium Bicarbonate*

A-7.2.4 *Sodium Thiosulphate,* 0.01 N.

A-7.3 Sample

The samples on which the test is to be carried out shall not be exposed to light and air. All samples shall be placed in a can previously purged with nitrogen as soon as they are taken.

A-7.4 Procedure

Place 25 ml of glacial acetic acid in titration flask and add 1 ± 0.5 g sodium carbonate. Stir well for two minutes. Connect electrodes to dead stop apparatus and adjust its sensitivity.

A-7.4.1 Add 1 g of potassium iodide and stir for 5 min.

A-7.4.2 Add approximately 80 ml of sample (containing 0.05 to 0.06 meq of active oxygen) and stir for 5 min.

A-7.4.3 Add **5** ml water and titrate with 0.0l N sodium thiosulphate. Record titration curve plotting the number of milliliters of thiosulphate against the number of millivolts measured. Determine inflexion point (*see* Note).

NOTE — In the absence of a suitable electrometric apparatus, liberated iodine (yellow colour) may be straightaway titrated with 0.01 N sodium thiosulphate solution to a colourless end point.

A-7.5 Calculation — Calculate peroxide content as:

$$\text{Active oxygen mg/l} = \frac{A \times N \times 8000}{V}$$

Where

A = volume in ml of thiosulphate solution, used for the titration;

N = normality of thiosulphate solution; and

V = volume in ml of the sample used.

A-8 TEST FOR THE DETERMINATION OF WATER CONTENT

A-8.0 General — The water content is determined by Karl Fischer method.

A-8.1 Procedure — Take about 10 g of the sample, weigh accurately and determine the water content by the procedure given in IS 2362.

ANNEX B

(*Foreword*)

LIST OF REFERRED INDIAN STANDARDS

IS No.	*Title*
265 : 1993	Hydrochloric acid — Specification (*fourth revision*)
323 : 2009	Rectified spirit for industrial use — Specification (*second revision*)
915 : 2012/ ISO 1042 : 1998	Laboratory glassware — One-mark volumetric flasks (*third revision*)
1070 : 1992	Reagent grade water — Specification (*third revision*)
4161 : 1967	Specification for Nessler cylinders

ANNEX C

(*Foreword*)

COMMITTEE COMPOSITION

Organic, Chemicals Alcohols and Allied Products Sectional Committee, PCD 09

Organization	*Representative(s)*
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Central Drug Research Institute (CDRI), Lucknow	Dr Sanjeev Kanojiya
Central Revenues Control Laboratory, Delhi	Dr T. A. Sreenivasa Rao
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Indian Chemical Council, Mumbai	Dr Mritunjay Chaubey Shri J. I. Sevak (*Alternate*)
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Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Catalogue' and 'Standards: Monthly Additions'.

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Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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